

Pathways towards applied policy integration for sustainable agricultural systems:

Workshop Proceedings

University of Copenhagen
2-3 September 2011

Edited by:

Simon Swaffield
Jørgen Primdahl

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Lincoln University, New Zealand and University of Copenhagen, Denmark

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Preface

Change in agricultural landscape systems is driven by a combination of external driving forces and local dynamics. Structural developments in agriculture and urbanisation processes of different kinds are of particular importance. Their combined effects are expressed in diverse ways within different types of landscape system and policy environment, and are always mediated through the reactions and actions of local communities and individual agents (particularly farmers).

A policy challenge in all agricultural systems is to practically integrate at the farm and landscape scale the consequences of different domains, types and levels of public policy, in particular those derived from the global market agenda (including agricultural policies), and those from the sustainability agenda (including environmental policy and spatial planning). Local agents (farmers, managers, and planners) need to reconcile these imperatives, and it is a prerequisite of successful policy implementation that local agency is understood as a policy target and addressed in policy design.

The 'Pathways' Copenhagen workshop aimed to progress understanding of ways to enhance local landscape scale integration of global policy agendas. It brought together international experts, policy analysts and emerging researchers from ten OECD member states. A point of departure was a recent text: 'Globalisation and Agricultural Landscape: Change Patterns and Policy Trends in Developed Countries' (Primdahl and Swaffield (eds) 2010 Cambridge University Press, ISBN 978-0-521-51789-8). That text presented an analytical approach to understanding the intersection of global policy agendas within local landscapes, and included a range of case studies of agricultural landscape change and management in OECD member states with varying levels of producer support. The presented papers at the Copenhagen workshop reported here range in focus from specific examinations of 'best' landscape practices in specific case study areas, to more broad ranging reviews of ways to enhance the outcomes of agricultural landscape management, for example by changing the logic of the policy narratives that underpin agricultural production.

The meeting was an invitation only event, with keynote speakers, emerging researchers, and policy advisors involved with landscape policy research at various levels and scales. The workshop was a collaboration between Copenhagen University, Denmark, and Lincoln University in New Zealand. Initial support for organising the workshop was provided by the Villum Kann Rasmussen Foundation of Denmark.

Speakers whose abstracts are presented in Part One have been sponsored by the Co-operative Research Programme on Biological Resource Management for Sustainable Agricultural Systems of the Trade and Agriculture Directorate of the OECD, which has also supported the production of the proceedings.

Speakers whose work is included in Part Two comprise emerging researchers who were specifically invited to contribute. Other participants at the workshop included a number of experienced policy analysts, whose contributions to the discussion are acknowledged. The key research issues that emerged from the discussions are summarised in the following section.

Summary of Issues

The workshop discussions identified and explored a number of agro-environmental policy related issues in the context of the global-local relationships at the focus of the programme, and the examples presented in the extended and short abstracts. These included:-

Understanding diversity

There is rich diversity of types of agricultural landscape systems, system dynamics, and pathways of change, which cross cut different countries. Recognizing differences and commonalities requires empirical studies of the response of local agricultural practices to external drivers and comparison of the effects of policy initiatives on different landscape systems.

Redefining policy goals to address resilience, risk and uncertainty

Traditional local management practices are breaking down in the face of globalisation, and new policy imperatives are emerging, framed by concerns of food security, resource scarcity, land use competition, and the need for resilience of production systems in the face of economic and environmental risk. Good practice must move beyond dealing with environmental and social symptoms of market failure to better anticipate emerging needs and problems.

Linking policy with practice in local landscapes

Diversity of landscape conditions and increasingly complex networks of food and fibre production, ownership, and value, require a nuanced 'polycentric' approach to agri-environmental policy, with international and territorial policy goals and priorities framing locally based governance. Detailed understanding of local agri-environmental conditions, agricultural practices, ownership, tenure, and cultural meaning is critical to effective local governance.

Institutions

Institutions are needed that enable environmental entrepreneurship and management within commodity chains to engage more effectively with local collaborative landscape governance and action- better aligning the dynamics of production with local place making and empowerment. The ecosystem services paradigm requires refinement to ensure contextually and spatially sensitive implementation. Action research developing models of local landscape governance and configuration to support integrated services and functions is an essential step towards successful adoption of new policy initiatives.

Urban – Agriculture relationships

New local relationships are emerging between urbanisation and agricultural production. These include the role of part-time farmers in both urban and rural economies, changing tenure patterns, and enhanced food production within urban settings. All require new policy and research paradigms. There is scope to utilise demand management in food systems (such as local food initiatives) to enhance overall system sustainability.

Concepts and communication

Framing imaginative narratives of change is critical to the way policy can be integrated at a local level. Policy language must be shaped to define common goals within and between the researchers and civil society in different cultural and political settings.

Questions

A number of policy and research questions emerged during the discussions. The key questions included:-

1. What might be the practical landscape management implications and effects of a more polycentric and networked agro-environmental policy framework?
2. How can we design and support local landscape management institutions and forms of governance that have:-
 - Capacity to adapt, integrate and implement higher level policy agendas within local agricultural landscape systems?
 - Resilience to changing markets, technologies, policy priorities and policy delivery mechanisms?
 - Potential to effectively link environmental management and entrepreneurship originating within global supply networks with local territorial governance at the landscape level?
3. Can place-based territorial concepts such as landscape systems and landscape multi-functionality gain policy legitimacy across the diversity of OECD member states? If not, what other concepts could provide an equivalent foundation for the locally integrated provision of both agricultural products and ecosystem services in an efficient, resilient, and sustainable way?

Future work

The Pathways 2011 workshop was intended to reinforce and widen collaborations within a network of researchers who have interests in sustainable management of agricultural landscapes, and a particular commitment to identifying good examples of current practice. These proceedings provide a record of the workshop. The next step is preparation of a journal theme issue with papers from the OECD sponsored speakers, due for publication in early 2013. Alongside that initiative, a symposium will be proposed for an international conference later in 2013, with the longer term aim of an international textbook, as a companion volume to the 2010 text which provided the starting point for the Copenhagen workshop.

The network of researchers established at the Copenhagen workshop welcome additional contacts, who are encouraged to access the network via the Leap website at Lincoln University www.leap.ac.nz

Simon Swaffield and Jorgen Primdahl
December 2011

PART ONE

Integration of policies in times of scarcity: a demand-side approach

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The food crisis of 2008 has clearly shown its roots in the dependency of agriculture on oil and other non-renewable resources. Time series show that when food prices increase, oil and fertilisers prices increase at a higher rate. Foresight studies, agree that this is a long term trend. The pressure of human activities on world resources has generated consumption rates near to the maximum rate of extraction (the 'peak'). According to several observers, humans have entered into the scarcity era (Passenier and Lak, 2009). The implications of this passage can be more easily understood when another aspect is acknowledged. According to some scholars, humankind is now into the Anthropocene (Zalasiewics et al 2008), a geological era in which, for the first time in the world history, the human species has acquired the power to modify the Earth Ecosystem. This implies also that human choices may undermine the conditions of existence of the Earth as we know it.

When the issue of scarcity – an anthropocentric concept – is linked to the implications of entering into the Anthropocene – an earth centered concept - era, it becomes clear that we cannot leave human activities driven by spontaneity. Humans have entered a time of a) high instability, as Earth ecosystem change increases the occurrence and intensity of critical events, and b) stress, as scarcity generates increasing difficulties for human societies in carrying out livelihood activities. A recurrent statement is that 'business as usual is no option': to limit the disruptive potential of human activities societies need to set conservative rules and to be able to steer processes of change.

But how can the transition to a new set of rules for human activities be shaped? The recent 3rd SCAR foresight exercise (SCAR 2011) has highlighted that the way societies try to solve emerging problems is framed by 'narratives':- that is, storylines that give a coherence to the type of problems, the range of instruments, and the range of solutions that people face. Narratives, in this sense, provide *descriptive accounts* - claims about objective reality as threats, opportunities and imperatives - *normative accounts* - claims about necessary or desirable responses to that objective reality, and *policy instruments* for carrying out those responses (Levidow, 2008).

The SCAR foresight exercise suggests that it is time to look for narratives different from those used so far to solve societal problems. The currently dominant narrative, which can be labelled as 'the productivity narrative', takes increasing demand for food as a given, and looks for – mainly technological – solutions to make supply adequate to it. The response to scarcity in this narrative is efficiency – that is, using fewer resources for each unit of output. However, efficiency may not be sufficient if there are not mechanisms to address demand. If resources are scarce, and demand grows uncontrolled, gains in efficiency will only be a further opportunity of increasing consumption and extract more resources.

The alternative narrative proposed to deal with scarcity, the 'sufficiency' narrative, stresses that the present system generates overconsumption (demonstrated by the increasing rates of obesity) and waste (up to 40% of the food produced). As a consequence, mechanisms should be found to act on the demand side to develop sustainable consumption styles, which can be at the same time be healthy, sustainable, and (why not?) happy. In the food sector this narrative applies very well, as there is increasing consensus among specialists that a plant-based nutrition would meet the goals of health, ecological sustainability, and availability of food for a growing population concurrently.

A narrative-based approach can also be a key to integration of policies. It applies to all decision makers, be they consumers, producers or policy makers, and its semantic flexibility (stories can be narrated with infinite variants on the main theme) allow for the interaction and alignment of different social worlds.

As an example, the narrative of sufficiency can be mobilized into urban food policies. We start by observing that a) the city is structured around the need to feed its inhabitants; b) the characteristics of the city structure food consumption; and c) food consumption structures the landscape and rural society. Urban policies can therefore activate behavioural change, and this, in turn, can act as a driver for sustainable patterns of territorial development.

A 'sufficiency' narrative looks at cities as socio-technical systems, made of original patterns of interaction between actors, rules and artefacts. Each of the components enables and constrains the other. For instance, railways have broken the dependency of cities from the surrounding countryside, the introduction of refrigerators has influenced not only the systems of provision but also consumption patterns, food hygiene rules have changed the competitive scenario among food producers and distributors.

In the last decades the socio-technical systems around urban food has been dominated by private actors, and first of all retailers. Supermarket shape consumers' choices, influence the competitive structure of the food sector, leave a strong fingerprint on urban landscapes and to a certain extent shape social interaction, insofar as malls replace public squares. In a sufficiency approach, urban governments should bring control of at least part of these processes into public hands. As instability and uncertainty are the characteristics of the new times, the issue of urban food security emerges as a key policy goal, and this goal can be fulfilled through the coordination of a series of policies such as territorial planning, commerce regulation, public procurement, health prevention, waste management.

In this approach, education, information and communication are keys to change, and local governments can do much on this regard. Moreover, there is an increasing number of consumers/citizens starting collective initiatives of civic engagement centered upon food, whose energies could be mobilized through appropriate participation channels to integrate public resources in the pursuit of a common strategies. Reframing the food supply narrative from production to sufficiency is therefore one possible strategy to better manage the dynamics at the interface of global market dynamics in food and the sustainability of local landscapes.

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Cash crops and conservation: policy and practice implications for Canadian and American farmers

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Cropping intensity, nutrient use, and manure application is globally concentrated around mid-latitudes. In North American landscapes, the Upper Mississippi River and Great Lakes watersheds are dominated by row-crop agriculture and are among the continent's most intensive cropping and nutrient use. The two regions are spatially linked to agricultural non-point source pollution and to notable broad-scale environmental issues such as the hypoxic zones in the Gulf of Mexico and in Lake Erie. They are the working landscapes of mid-continental farmers who affect and are affected by policies for environmental stewardship and agricultural trade.

Canada and the USA co-operate on many policies including environmental agreements (e.g., Great Lakes Water Quality Agreement) and international trade (e.g., North American Free Trade Agreement). Likewise, both nations have agricultural policies that affect farm production, and sustainability agendas that exist within and outside of agricultural policies. USA policy includes domestic energy security (requiring ethanol-gasoline blends). The intersection of policies and farming practice is marked in the working farms of middle North America.

The USA "Farm Bill" policy (especially the Conservation Title) uses land retirement and working lands programs to effect stewardship (Cowan *et al.*, 2009). In Canada several environmental policies apply to farming and the most popular delivery mechanism is the "Environmental Farm Program" (Filson, 2011). For the intensive agriculture of Corn Belt Iowa and the Lake Erie Lowlands of Ontario policies enact stewardship practices that include retirement of highly-erodible land, establishment of riparian buffers, nutrient management, and renewable energy production.

In spite of stewardship policies and programs, other initiatives (including trade and energy) compromise environmental goals. Despite declining direct commodity support, conservation program spending in the Corn Belt and Iowa is dwarfed by spending that requires intensive row-cropping to qualify for subsidies, insurance, or income stabilization (Cox *et al.*, 2011). Ethanol-gasoline blends in the USA increase corn production in both countries. The OECD notes large supports for dairy, corn, soybeans, and wheat in Canada and USA (Organization for Economic Co-operation and Development, 2010). These three crops are the principal rotation covering 83% of Ontario's Lake Erie Lowlands. Corn and soybeans in rotation dominate the same proportion (83%) of Corn Belt Iowa.

Tenacious environmental consequences of agriculture persist. Iowa and Ontario have excessive soil erosion and water contamination from nutrients, pesticides, and coliforms; habitat quality is diminishing; greenhouse gas emissions from agriculture are increasing (Cox *et al.*, 2011; Eilers *et al.*, 2010; Ribaud *et al.*, 2011). These concerns are directly related to intensive cropping of annual plants (soybeans, wheat, corn) and a decrease in perennial cover (hay, pasture, non-crop vegetation). Market certification programs like Ontario's "Corn Fed Beef" might exacerbate corn cropping intensity at the expense of pasture. Corn-based ethanol requirements increase nitrogen pollution of surface waters (Donner and Kucharik, 2008).

Modeling can predict environmental responses to trade liberalization. A Canada-wide model for two approaches to liberalization estimates that risks of water contamination by nitrogen, residual soil nitrogen, and GHG emissions will all increase as wind and water erosion likely decrease and habitat

availability improves (Eilers *et al.*, 2010). Yet most of these changes are modest – less than +/-5% from current rates. Current environmental stewardship needs therefore hardly change under trade liberalization scenarios.

Policies and practices that reduce soil erosion and risks of water contamination, lower GHG emissions, and improve habitat and biodiversity remain important. The Conservation Reserve Program (CRP) achieves all of these (to varying extents). Though the CRP requires land retirement it successfully addresses most pressing environmental issues. Working lands policies and practices in both countries include nutrient management planning and conservation tillage. The Farm Bill provides for using constructed wetlands to improve drainage discharge water quality. The EFP provides a cost-share for the retirement of riparian buffers, and of reduced tillage and precision agriculture machinery. In spite of these policies and programs, intolerable soil erosion and other undesirable consequences of farming stubbornly persist. More innovation in policies and practices are needed.

Supporting farm income stability and cash flow (through supply management) seems to be related to adoption rates for beneficial management practices in Ontario (Filson, 2011). Reducing price supports for farm commodities is an important trade goal. The US Farm Bill and Ontario's Green Energy Act (GEA) pay farmers for renewable energy production. The CRP permits erection of wind energy turbines and the GEA pays a premium for solar, wind, and biomass generated electricity. With predictable and regular payments from energy generation, farmers' incomes are stabilized which might increase best management practice adoption rates.

Intersecting stewardship and trade agendas require working farm landscapes that continue to produce row-crops for food, feed, and fuel *and* reduce soil erosion, maintain water quality, balance GHGs, and improve habitat and biodiversity. Prospective practices such as intercropping annual crops in narrow strips with native perennials yield environmental and economic gains within patterns of vivid stewardship appreciated by farmers and others (Nassauer, 2010). Farm-based renewable energy policies might introduce strips or terraces of solar panels or create demand for cellulosic ethanol feedstock like native prairie vegetation (Fargione *et al.*, 2009). Environmental reports decry the loss of perennial cover in favour of annual row crops: imaginative re-integration of perennial vegetation is needed. The transformation of annual row crops – notably wheat – into perennials has proceeded with some success (Scheinost *et al.*, 2001).

Intensively-machined and cropped landscapes of Iowa and Ontario are the epitome of production agriculture in North America. They continue to face environmental problems while being among the world's most productive farms per unit area. As trade agendas move to liberalization, these landscapes are likely to experience changes in environmental concerns – though the changes in intensity or magnitude are likely to be small. Perennial vegetation remains one of the most effective ways of addressing concerns. Policies and practices that encourage perennial cover while stabilizing farm income (like the CRP does in the USA) continue to be highly effective. Additional ingenuity will identify approaches to do the same within working lands. Truly “best” practices for agriculture and trade should anticipate likely policy and farming changes and find practices to address consequences in ways that are adopted, effective, and lasting.

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Policy integration for sustainable agricultural landscapes: *taking stock of UK policy and practice*

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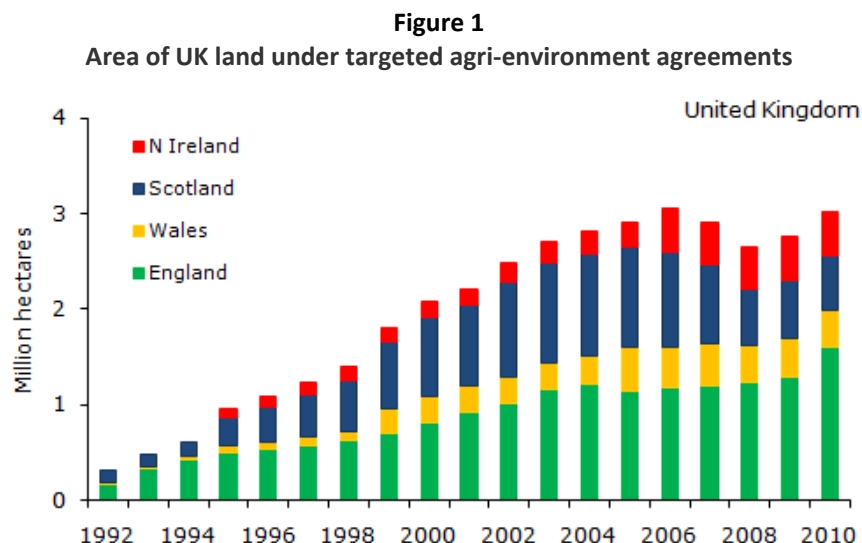
Recent years have seen some stagnation in UK policies for sustainable agricultural landscapes. It seems clear that conventional approaches are insufficient, with constraints including both policy and non-policy factors. However, as we move into a new decade, non-policy innovations may offer lessons for an improved approach.

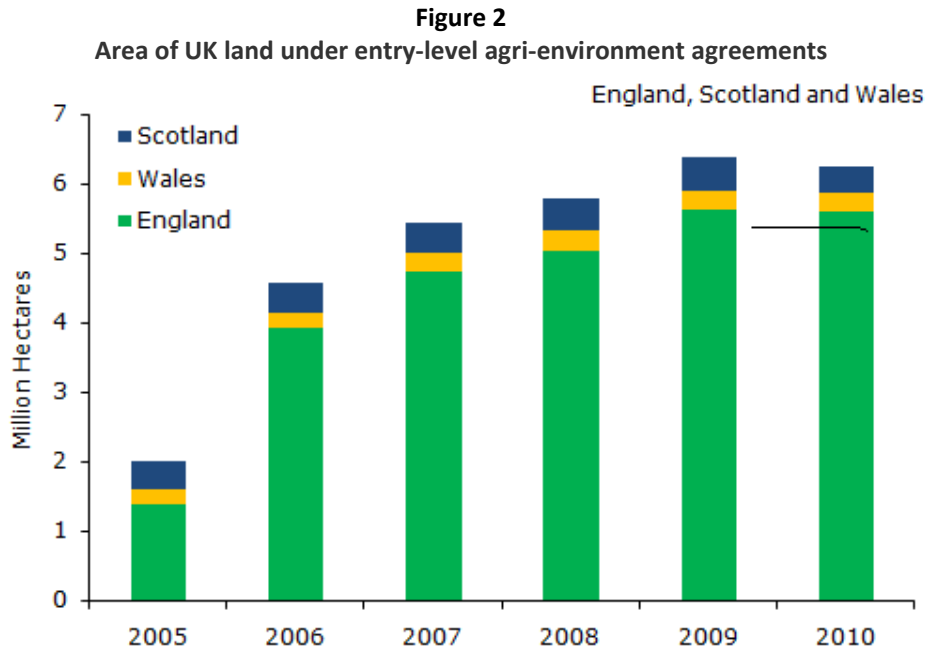
Assessing the policy approach

The most significant element in the UK policy approach to sustainable agriculture has been agri-environment schemes. From 1985 there has been steady growth in these schemes, which now cover over one-third of farmland. Earlier schemes were targeted to specific areas, or identifiable 'landscape types' (e.g. uplands, watersides) and relatively ambitious kinds of management option (input reduction, habitat restoration, etc.). More recent 'entry-level schemes' offer many more farmers options requiring less radical change (figures 1 and 2). Agreements now comprise a wide variety of management, designed both to maintain and restore less-intensive practices as well as to support land management at risk of abandonment.

UK policy has also made increasing use of other instruments. Regulation has been instigated at EU level, e.g. in the Habitats and Nitrates Directives, controls on agricultural wastes, pesticides and the Water Framework Directive. These seek to raise baseline standards of 'good farming practice'. In parallel, this 'baseline' has been linked to mainstream support under the Common Agricultural Policy, via cross-compliance. Evaluations judge this approach to be most effective in providing a *policy message* to the farming industry, about sectoral norms.

Investment aid has also been offered to shift farming systems towards better environmental practice, particularly in respect of resource protection. In addition, targeted advisory projects are increasingly being used.





So, what have we learned, from this policy mix? Evidence suggests the following:-

- Payment schemes have been popular especially in marginal farming areas – they provide income and clarity of commitment and, when capital grants are included, can support the local economy and community (Boatman et al, 2008).
- Regulation has become more accepted, over time, but may encourage ‘technical fixes’, not always sustainable systems. Often, it works in combination with incentives, offering a ‘carrot and stick’ approach (Dwyer et al, 2002).
- Management prescriptions can be designed for many different environmental goals, with multiple options (Radley et al, 2003).
- Although evidence of widespread environmental benefit is elusive, many notable local successes exist (Boatman et al, 2008).

Weaknesses and gaps

Despite this progress, UK policies suffer from significant weaknesses and gaps. These include:-

- Ongoing communication, advice and learning – raising farmer awareness, promoting greater environmental understanding, encouraging farmer commitment and follow-through – is frequently underprovided in the policy mix (Dwyer et al, 2007).
- Current UK policy involves too much centralized design and over-prescription, so instruments are insufficiently sensitive to local conditions (Boatman et al, 2008). This removes the incentive for environmental innovation by farmers. Standardised approaches also cannot generate valuable micro-variation (Burton et al, 2008).
- Contradictory signals from other policies also reduce efficacy. Underlying economic drivers constrain many farmers’ ‘room for manoeuvre’ (Van der Ploeg, 1994, Dwyer et al, 2007), which can distort the impacts of environmental policies.
- Lastly, the social aspect of sustainability - the people, customs and values of ‘agri-cultures’ (Pretty, 2002) – are almost completely ignored in UK policy. As a result, continuing structural change towards ever-larger commercial farms has brought significant social costs (Hall and Pretty, 2006).

Analysis of issues

Recent analysis of *policy impacts* in the English uplands (Dwyer et al, 2010) highlights many of these points. Agri-environment schemes ‘cherry-pick’ the most valuable habitats, but because wider CAP support has been declining over time in these areas, farms must increase productivity. These influences drive a gradual ‘zoning’ of a landscape which was hitherto functionally integrated. At the same time, many farmers increasingly struggle to cope with the day to day demands of managing larger numbers of stock and land areas. Disease control policies also work against environmentally-benign systems. The net result is landscape fragmentation, working against long-term sustainability.

Policy processes generate weaknesses. One problem is an overly-strong audit mentality. As Lee says: ‘Some of the current structures and cultures of audit militate against effective delivery: they are too focused on processes and rules rather than outcomes; too focused on micro issues rather than strategy; and strongly skewed against entrepreneurship.’ (Lee, HMG, 2001). Funding pressures are also relevant: agri-environment budgets have altered frequently, generating a ‘tap on, tap off’ pattern, creating cynicism and disengagement among farmers and delivery teams. Money may also be lost if measures don’t spend their allocations, so resources shift to ‘quick-spend’ options, which often means lower cost-effectiveness. Schemes without advice and targeting may be cheaper to deliver, but evidence suggests this is a false economy. Today, agri-environment schemes in most UK regions have low-paid staff and offer little ongoing technical support and almost no feedback to farmers, once they join.

The *broader political context* is also important. In the UK, the environment has replaced production as the key goal for policy support to rural land, but maybe because environmental interests were previously marginal, they closely guard their new-found supremacy, pursuing ‘clean, mean and green’ tactics. But many farmers now feel marginalised, due to a food ‘disconnect’ (Curry et al, 2002); CAP reforms and accumulating social needs (Hall and Pretty, *ibid*). These circumstances lead to widespread mistrust and misunderstanding, undermining policy delivery.

Even *theories* generate problems and missed opportunities. In economic theory, the environment is perceived as an ‘externality’ of production, with ‘public good’ characteristics, implying a need for the public to pay for its provision. In reality, the situation is more complex, and hybrid and negotiated solutions are possible which need not cost taxpayers so much. Economic theory (enshrined in WTO rules) also requires that the payment logic for schemes must be compensatory, to avoid ‘trade distortion’. But there is much evidence that compensation alone can’t sufficiently incentivise improved environmental performance. And Tinbergen’s rule of ‘one goal, one tool’ is an oft-quoted theory which can be impractical and inefficient, in our multifunctional world.

Innovation, and ideas for future policies

Looking beyond public policy, private and NGO actions offer innovative examples, suggesting alternative ways of approaching sustainability in agricultural landscapes.

Many examples concern collective action by farmers / local actors; some partly ‘within’ an agri-environment policy framework; some entirely outside. Many offer farmers an environmental ‘marketing edge’. For example, ‘Linking Environment And Farming’, established 1991, promotes Integrated Farm Management and now boasts 1,600 members mainly in the UK. It offers a self-help environmental audit, peer support and training, and marketing opportunities via a supermarket quality ‘marque’. Mills et al (2010) found LEAF members cite significant financial, environmental and social benefits from membership.

Others involve private companies. Water companies have gained powers, in recent years, to finance ‘upstream’ projects working with farmers to prevent diffuse pollution and reduce treatment costs.

South-West Water is working with a local NGO to deliver advice and grants in key catchments, with promising results. It is now seeking to extend provision to multi-annual contracts, which will not be constrained by WTO rules because they are independent of public funding.

Many more initiatives of interest can be identified. One common feature is a strong collective ethic, increasing farmers' commitment to the underlying goals of sustainability action (Mills et al, 2008). Another is initiatives which preserve farmers' interest in experimenting, stimulating environmental innovation. Finally, many initiatives are proud of their independence, emphasising ownership of the environmental agenda.

Looking ahead, society seeks an increasingly complex mix of goals from the management of rural land (Dwyer, 2010). To deliver these, Ostrom (2010) calls for *polycentric* policy, less 'one size fits all', more flexible for different scales and governance: to enable increased innovation, learning, adaptation, and more sustainable outcomes. This suggests EU and national policies taking a 'framework approach', with much more support and design at local level. Greater farmer and 'expert' ongoing involvement is also needed, sharing knowledge and experience, and experimenting in 'communities of practice'. This favours an approach seeking sustainable farm business strategies, rather than 'detached' environmental outcomes. UK policy is just beginning to experiment with these ideas.

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Capitalizing on public goods provision for the management of fragile agricultural systems: differentiation in innovation capacity of land managers in the face of conflicting policy regimes

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Transition theories suggest that there is a spatial, temporal and structural co-existence of several processes of transition from productivism to post-productivism going on in rural areas in multiple and complex combinations (Geels and Schot 2007; Wilson, 2007). Transition can be characterized as a shift from the formerly dominant production goals towards a more complex, contested, variable mix of production, consumption and protection goals. This is particularly true for South European landscapes dominated by extensive agro-silvo-pastoral systems and small-scale mosaic farming, with a fragile agricultural sector which in some cases is just entering the productivist phase, let alone moving towards post-productivism (Pinto-Correia Pinto-Correia 2010; Robinson 2008), both in terms of discourse and management practices (Tilzey & Potter, 2008). However, these are landscapes increasingly valued by society, due to their potential for providing public goods related to environmental quality, nature conservation, landscape character and cultural identity. This encourages new strategies for farm survival and new ways of managing the land (Marsden, 2003; van der Ploeg et al, 2009) – requiring a paradigm shift, at farm level but also in policy formulation and targeting.

Land managers face multiple transition trends, and their different relations to the type of farm unit they are managing results in multiple combinations of land manager profile and land management. The trends and combinations are illustrated in a local area in Southern Portugal, the municipality of Montemor-o-Novo. The area is located partially within a Natura 2000 site due to the presence of a hilly area, Monfurado, and the dominance of a well maintained and diverse Montado (together with the Dehesa, the agro-silvo-pastoral system characteristic of Southern Iberia). But it is also at a cross road of emerging demands as residential and recreation area, due to the Montado landscape but also the proximity of the Metropolitan area of Lisbon (100 km). It is thus a landscape maintained through the extensive livestock production and combined forestry system, and supporting today a wide range of environmental and social public goods, which could therefore profit specifically from public policies promoting public services. A typology shows the position both of the manager and of the farm unit in the multifunctionality spectrum. It reveals that even if only considering large scale farm units with extensive uses, there are many combinations of land owners and land management taking place in just one municipality. The typology makes it possible to assess how land managers may adapt and make use of policy mechanisms, and how policy can be targeted in a way that considers the differentiation of existing situations.

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Agricultural sustainability under pressure from urbanisation: Segregation and integration of land based policy regimes

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Agricultural sustainability is affected by natural conditions such as climate, soil, and water and by socio-economic drivers of agricultural change including technology, market, public policy and the local cultural context. Relative increases in production costs (fertilizer, pesticides, energy) compared to food prices, the so-called 'price scissors', result in changing market conditions, as do changes in energy policy towards support for bio-fuels. These somewhat contradictory development trends both affect agricultural land uses and are intensively debated in academic as well as public discourses concerning agriculture.

Urbanisation in various forms also affects agricultural sustainability at different scales in time and space, and this is to a large extent ignored in the debates on the future of agriculture and food production. According to Champion (2001) four types of migrations are affecting the rural-urban relationship and therefore also agriculture. First there is the movement from rural hinterlands to urban centres. This is traditionally termed *urbanisation*, a process which historically is associated with industrialisation but which still occurs on a large scale, especially in developing countries and former communist countries. Although this form of urbanisation can be seen as the result of decline in agricultural jobs (and increase in urban jobs), rural depopulation may also lead to – or reinforce – agricultural marginalisation because of lack of labour as it is the case in Russia (Loffe and Nefedova 2004). Second there is the movement of people from the urban centre to the urban periphery, *suburbanisation*. During the 20th century this has been a process which, together with traditional urbanisation mentioned above and a substantial increase of land consumption for housing and industry (per inhabitant/job), has caused dramatic expansion of urban areas – mainly at the expense of agricultural land (European Environment Agency, 2006). These also have wider negative impacts on the agricultural structure within the fringe due to new infrastructure (roads, railroads, energy supply, rubbish dumps, water supply etc).

The very design of urban growth patterns, the new urban form, also has varying degrees of negative effect on agriculture (Antrop, 2004; Primdahl et al. 2010). The migration from towns and cities is termed *counter-urbanisation* and represents a process which has been significant in North America and Western Europe from the 1970s until now. (Redman and Foster, 2008; Fielding, 1989). This process may have clear impacts on the agricultural sustainability because commercial agriculture may be replaced by hobby farmers – that is by farmers who have their main income from outside the farm (or pensions gained through former urban jobs) (Busck et al., 2008). Finally, Champion (2001) refers to re-urbanisation as process of re-growth of urban centres associated re-vitalisation of urban environments. This particular process does not have any direct effects on rural agriculture but may influence urban agricultural development.

The first three forms of urbanisation processes mentioned above are regulated in most – if not all – developed countries through land use legislation and spatial planning. This may be done through various 'containment strategies', through various zoning systems and other restrictions on land use building activities (Millward 2006, Hall and Tewdwr-Jones 2010). Common concerns underlying these regulations are linked to the functionality – especially in terms of transport – of the urban spaces and with environmental issues related to water resources, land consumptions, habitat conservation,

heritage and scenic values. The consequences for agriculture are often given low priority or ignored. Moreover land use legislation and spatial planning belong largely to a policy domain which is not well integrated with environmental policy (Healy 1997), and more or less separated from agricultural policies. Whereas spatial planning and environmental policies are linked to what has been termed 'the sustainability agenda', agricultural policies belongs a market policy agenda. Despite the conclusions and proposals for policy integration in the so-called Brundtland report the two agendas remains segregated when it comes to land use issues.

Detailed empirical studies of recent agricultural structural developments in different Danish landscapes show how agricultural structural changes are intersecting with counter-urbanisation processes. Hobby farmers are increasing in numbers, and also in share of land – even in landscapes with relative long distances to urban centres- whereas full time farmers are declining. The studies reveal that the majority of farm owners mainly see their farm property as a living place – as opposed to a 'production space' or an 'equal combination' of these two motives to own the farm. The clear differences among different types of farmers in their 'landscape practices' are seen as major land use changes (between land in tillage, woodland, grasslands and uncultivated habitats of various kinds) and the creation/removal of new uncultivated linear or point elements (hedgerows, open ditches, ponds, thickets etc.). Farmers who mainly see the farm as living place reduce their land in rotation and create relatively more uncultivated elements than they remove - several times more than do full time farmers. There may be clear environmental benefits from such developments, but as it takes place on land which formerly belonged to full time farms, counter-urbanisation is 'causing' land (and livestock) to go out of agricultural production.

Analysis of recent developments in Danish legislation demonstrate how the protection of agricultural land against 'urbanisation' (including counter-urbanisation) has been more or less given up as part of de-regulating the national Agricultural Holdings Act. In addition to this, restrictions to new housing and non-agricultural developments in rural areas have been relaxed due to de-regulations of the planning law. New policy and planning solutions are needed to sustain agriculture and food production within multifunctional and partly urbanised rural landscapes.

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Sustainability practices in agricultural landscape systems: challenges and opportunities in an effects based policy regime

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New Zealand has an open globalised economy. Agriculture is its largest export sector, and operates with minimal subsidies (Dalziel and Lattimore 2004). The planning regime focuses upon managing the effects of land use activity upon natural resources using a polluter pays approach, operating within a governance paradigm that favours voluntarism, education and local partnerships over centralised regulation (Memon and Perkins 2000). The success or otherwise of this approach is much debated. There are good examples of collaborative land management but also major tensions in the system, particularly in regions where global markets and technologies are driving land use intensification (MacLeod and Moller 2006).

The radical changes in NZ economic policy and rural governance over the past 20 years are now widely documented. Interventionist economic management, soil and water conservation subsidies, and prescriptive land use planning characterised the post war 'long boom' (Easton 1997). They were replaced in the 1980s with a liberalised economy with minimal subsidies, and a performance based environmental planning regime (Boston et al 1991). Although hierarchical in structure, the planning regime was implemented with minimal government policy, and a strong focus upon enabling development (Memon and Perkins 2000).

Despite the goals of the reforms, rural water quality and biodiversity continue to decline, and there is growing pressure upon the farming sector to improve its environmental management (OECD 2007). However the critical role of agriculture in the national economy underpins a reluctance to implement strong national environmental standards, and local and regional government has lacked either capacity or political will to effectively fill this lacuna (Ericksen et al 2004). Improvement in environmental performance relies significantly upon industry and community based initiatives. A pilot survey of key expert informants has identified two broad categories of 'best practice' in integrated rural land management emerging from the NZ experiment. They are 'systemic' industry based techniques, and territorial agro ecological concepts.

As a commodity producer NZ is under pressure to extend its influence up the value chain, and product certification has emerged as a key systemic practice that offers significant environmental gains. One key feature is product traceability, by which consumers in supermarkets and stores in developed markets can connect back to the people who made or grew the product. Icebreaker is one well known example, but the system highlighted by the key informant survey is Zespri, the kiwifruit marketing organisation. A particular feature has been 'transformative resilience' expressed as adaptive cycles of improvement, progressively reorganising and refining techniques and systems to supply fruit based on an organic production with no detectable residue. Nutrient and gas emission budgets are another important systems based practice. The underlying proposition is that focusing upon maximum efficiency and elimination of waste is the most effective way to avoid non-point source pollution. Carbon gas foot-printing and nutrient budgeting are two best practice examples identified.

Territorial approaches highlighted by informants include riparian plantings, whole farm plans, area co-management, and integrated catchment management. Riparian planting is being promoted through a national Clean Streams Accord, and also through a range of regional council schemes and

local initiatives. Farm Environmental Plans are used for erosion management, for example in the south central North Island. When combined within area co management in dryland projects such as Starborough Flaxbourne, Marlborough, they adopt a natural capital framework to build resilience to economic and climatic variability. Integrated catchment management has been effectively demonstrated in several case studies, a notable example being the Motueka project through LandcareResearch Ltd.

Key informants highlighted the importance of local leadership in successfully managing the interface between global and local. Industry commentators also noted the role of enlightened self- interest, through which producers implement good practice in order to achieve enhanced efficiency of production, and to maintain control of their options and avoid the imposition of more strict regulation by statutory authorities or government. Partnerships based upon trusted relationships between industry, researchers, farmers and regional councils are essential. Science was not regarded as the primary indicator of successful practice, due to the complexity of measuring landscape performance-peer recognition and business viability were more useful guides. Perhaps inevitably, informants tended to emphasise approaches that were associated with their sector, and it is also important to note that some conservation experts were much less optimistic about the likelihood of successful practice under the current neo-liberal regime.

The challenge in implementing integrated local systems lies at the heart of the tension between global and local dynamics in rural landscapes- how to better connect mechanisms that are internalised within commodity chains and production units with the complex social and ecological interrelationships of local landscapes (Swaffield 2010). The NZ experience may offer some insights for other producer countries or regions that are strongly connected to global markets, and which lack strong overarching regulatory frameworks. In these circumstances, the key to success appears to be a combination of local leadership, enlightened self- interest, and incremental pressure to improve performance by both regulatory authorities and the processing industry.

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Maintenance by development: the cultural landscape and heritage paradox in the Netherlands

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More than half of the world population now lives in cities, and open spaces in urban regions face unprecedented pressure all over the globe. Until recently land use planning strategies dealing with urban pressure on metropolitan landscape were predominantly defensive i.e. conservation-oriented. Today, traditional conservation policy is limited in its scope and impact due to societal changes such as the declining role of government and the growing importance of private agents, budget cuts, and the industrialisation of agriculture. In spite of growing efforts in government policy aiming at conservation, the old cultural landscape suffers from accelerating processes of encroachment. Paradoxical though it may seem to professionals in the domain of archaeology and landscape history, it is a fact of life.

Traditional government-led land use planning and heritage management can no longer provide adequate protection against the tide of modernization in the network society but change doesn't necessarily have to manifest itself in a destructive way. In land use planning practice mono-functionality and government-led top-down planning are being replaced by mixed land uses and participative bottom-up strategies. Identical concepts have lately pervaded the domain of cultural landscape and heritage management.

In the last ten years the Netherlands government and an interdisciplinary community of Dutch scientists and practitioners have devised and experimented with a unique offensive landscape strategy, labelled 'maintenance by development'. This new approach uses the concept of landscape biography in action research and communicative methods of planning to explore regional storylines which build on perceived opportunities and obstacles for landscape development and preservation. Landscape biography covers the history of a specific region, thus mapping physical transformations and changing local perceptions of place over time.

An interdisciplinary research programme conducted by a group of archaeology scholars, geographers, planners and landscape architects has used and developed core concepts that draw upon novel theoretical building blocks in the constitutive disciplines. These concepts have been applied in action research in four selected areas. The resulting regional landscape biographies have been put to test in on-going regional policy processes. Much attention was paid to solving tension in the research team between positivistic, mono-disciplinary and evidence based research and post-structuralist, trans-disciplinary, design and policy oriented research.

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New directions in food security and land use in Japan

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No country in the world is free from challenges, but when foreseeing the future of Japan there are two arduous challenges that may significantly affect the shape of the country. First is the shrinking and aging population. The National Institute of Population and Social Security Research (NIPSSR) reports that the population of Japan peaked in 2005 at around 130 million, and because of its significantly low fertility rate, 1.26 in 2005, the number may drop as low as 90 million, 70% of the peak, in 2050 and will keep dropping. Another demographic feature of Japan is its extremely long life expectancy, the longest in the world, resulting in a significantly large portion of elderly population. NIPSSR estimates that nearly 25% of the total population will be over 65 in 2020 and 35% in 2050.

The second challenge is calamitous natural disasters that frequently strike the country. The United Nations Development Program (UNDP) reports that the average number of people killed by disasters per million inhabitants between 1980 and 2000 was 2.87 in Japan, compared to 0.97 in USA, 0.17 in UK and Denmark, and 0.03 in Germany. Munich Reinsurance Company calculates the overall risk index of Tokyo as 710, while New York is 42, London 30 and Paris 25.

These challenges inevitably affect the way that food should be securely produced and provided to the society, and how cities, where 70% of the population is living, should be designed. Agriculture has already been a deteriorating industry in Japan for decades. According to the national statistics, 33% of the working population was involved in the primary industry in 1955, but the number dropped to merely 4.4% in 2010. Shrinking and aging population may sharply worsen the decline if no changes are made in conventional agricultural systems. The national government, which has been reluctant to change the system, finally decided in 2009 to open up the closed agricultural society to invite new capital and labor.

A shrinking and aging population may also result in shrinking cities. Numerous vacant lots are now simultaneously emerging in the periphery of Japanese cities. Series of fragmented agricultural lands, without a hope to be developed in the future, can also be found within cities. The city planning and zoning act, enacted in 1968, has been prohibiting agricultural activities on such lands, but the national government is now in the process of revising the act to allow agricultural practices to take place in urban areas.

Modern cities no longer produce their food but thoroughly depend on food supplied from external rural areas, including overseas. Such a system may be economically feasible but vulnerable to natural disasters as external food supplies may stop due to the collapse of transportation systems in such occasions. Under a high risk of natural disasters including earthquakes, tsunamis, landslides and floods, Japanese cities should not thoroughly depend on external suppliers, but be equipped with diverse food suppliers, including those in intra- and peri-urban areas. Agriculture in and around the city may not be able to constantly provide sufficient food to neighbouring communities in an ordinary situation, but may function as indispensable food suppliers in emergency events. Several urban municipalities, including Tokyo Metropolitan Government, are starting to count on urban agriculture to serve such a function in emergency events and allocate them as one of indispensable components of their hazard mitigation plan.

However, agriculture as a part of urban systems should not be in a conventional style but be designed as new practices which actively communicate with surrounding urban fabrics. A number of innovative practices, including allotment gardens and a school for teaching basics on agriculture to urban hobby farmers, small-scaled but high-profit agriculture specializing in specific herbs, fruits and vegetables, and organic agriculture under an exclusive contract with organic restaurants, are emerging in and around major Japanese cities as Tokyo. These practices are still in an experimental stage and thus limited in numbers, but the high demand by urban residents for safe and reliable agricultural products grown by themselves or by farmers in their neighbourhoods through such practices clearly indicate the future direction of urban agriculture in Japan.

Shrinking and aging population can not only be foreseen in the future of Japan but will soon be shared by a number of Asian countries including Korea, Taiwan, and Hong Kong, which are suffering from an extremely low birth rate already lower than Japan. Most of Asian countries are also suffering from frequent natural disasters caused by earthquakes and tropical cyclones. New directions in food security and land use in Japan may suggest how Asian countries should design their food systems and the land according to their vernacular landscapes.

The concept of clearly separating the urban fabric from the surrounding rural areas, which is one of the fundamental concepts of modern urban planning theory, is rooted in medieval European cities, where the densely populated urban area was clearly separated from surrounding rural areas by a fortress and moat. However, when we investigate the history of Asian cities what we commonly find is not a clear separation of urban and rural land uses, but a mixture of farmlands and urban fabric even in the central core of the cities. Modern urban planning theory may describe such mixture as a disordered chaos, but a “hidden” order may be found behind the chaotic appearance of Asian cities. The mixture of urban and rural land uses should not therefore be interpreted as a chaotic situation which reflects the absence of sufficient controls, but as a condition rooted in the Asian way of understanding and planning space.

Asian cities repeatedly applied urban planning measures originating in Europe and North America during the 20th century, and were in many cases judged to be incomplete and poorly executed attempts. It is true that not all of mixed land use in Asian cities should be positively understood but there are indeed chaotic realities which need a certain measure of control. However, it may also be true that the modern urban planning concept, which we tend to regard as an universal concept, is in fact one of local concepts rooted in Europe, where chances of natural disasters are extremely limited, and may not necessarily be suitable in Asia which are prone to natural disasters as earthquakes and tropical cyclones.

Respecting ecological functions of farmlands in and around the city and including them as an essential element for realizing “mixed land use without disorder” may be regarded as one of the key perspectives for the successful future of Asian cities.

PART TWO

Cultural landscapes and landscape culture - Integrating cultural anthropology with landscape research in decision making studies. The case of central Denmark

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An increasingly important research topic in landscape ecology and related fields is to develop spatially explicit valuation procedures for cultural landscapes, including associated landscape functions and elements of cultural or aesthetic importance. This is the case for example of research on ecosystem services, where aesthetic, recreational, identity-related and other not easily tangible aspects of landscapes are receiving increased interest, and where attempts to develop spatially weighted quantification measures for intangible landscape functions are being undertaken (Vejre et al 2010). This renewed interest in landscape intangibles supports a move away from small scale qualitative case studies to medium scale spatial quantifications of intangibles, and seems to be motivated by a growing awareness that the behavior of the landscape manager reflects culture, and that cultural valuation systems need to be included in research addressing such themes as sustainability and multifunctionality. This is especially the case for culturally motivated land use strategies, which cannot be easily developed without cultural information (Opdam 2011, Nassauer 2011, Pungetti 2011).

However, cultural issues are often implicit (or even ignored) in land use strategies. This means that the rationality which makes it imaginable and relevant for local agents as well as policymakers to invest meaning and resources into implementing such strategies has not been adequately and systematically investigated, or linked with other dimensions of the landscape typically studied, including land cover, land use and production. In contrast the trend in recent research seems to be to identify cultural value through the use of data on official designations of natural and scenic value or through the use of physical indicators of such values, which are decided upon through expert judgment and with limited underlying empirical evidence. Research of this kind may miss its point if the intention is to assist in accumulating knowledge on landscape manager motivation and strategy, because it easily becomes normative in its perspective on landscape value.

A more descriptive and empirically grounded approach may lead to a better understanding of the landscape manager, through an integrated analysis of the relationship between landscape-related cultural preconceptions in local society and land use, land cover and landscape history. Preliminary results from a pilot study conducted in 2009-2010 provide guidance on the design and implementation of a methodology able to include such cultural knowledge into traditional landscape ecological mapping procedures. It is concluded that monitoring strategies focusing on a systematic spatial comparison of the landscape culture of reflective human subjects found in case study landscapes, with associated economic, practical and physical aspects of such landscapes, may lead to knowledge relevant to a broader cultural sphere, which is suited for investigation into the cultural background of landscape manager decision making.

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Landscape, identity and community development in the rural periphery

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“Regional parks” is emerging as a potential tool for mobilisation and regeneration of farm holdings and community development in the rural periphery. The underlying processes in this concept are based on “bottom up” principles and building partnerships between local communities and regional authorities. It is also based on the concept of “broad value creation”, recognizing that sustainable rural community development must aim at integrating environmental, social, cultural and economic values and assets.

Topography and climate have made Norway a nation of small farm holdings and scattered settlements, except for a few lowland plains where the ice has deposited layers of moraine and clay, suitable for grain production. The strongly rooted independent culture of small scale farming and fisheries has also kept Norway outside EU, resulting in an agricultural policy with a higher degree of subsidies than most other European countries. During the last 15 – 20 years these subsidies has gradually been directed more in a green direction, supporting management of common goods like biodiversity, cultural landscapes and heritage values. The general trend is still a continuous decrease of farm holdings in active use, dereliction of traditional landscapes and decline of rural population and services. Approximately 25 % of Norwegian farm holdings are currently inhabited and in active use. Depopulation, loss of income and reduction of public services has forced communities to rethinking the traditional practice of sector planning in rural peripheral areas, in order to be able to serve vital functions for the society at large, and also be able to generate income and services.

In the Nærøfjord-area of the Sognefjord region, a group of farmers initiated a regenerative process about 10 years ago. The backdrop was partly the introduction of extensive nature conservation plans imposed by the national government, putting restrictions to the farmer’s potential use of their land. At the same time, the local community also experienced a growing interest from “outsiders” to connect to place through taking part in landscape management on a voluntary basis.

These external impulses evoked an understanding that the future of such communities must be built on a broad platform, bringing together and coordinating social, cultural and economic entrepreneurship based on sustainable management and use of local natural and cultural resources and assets. The function of agriculture and farm based activities in the rural periphery, must to a greater extent include being part of a common arena for broad value creation like place based learning and identity building through activity based experiences and participation.

The platform that was developed in the Nærøfjord-area was inspired by European regional park concepts, mainly from France and England. The “ Nærøfjord World Heritage park” was formally established in 2008 by the four municipalities related to the fjord landscape, in partnership with regional authorities, farmers organisations, community groups and other stakeholders.

The outcome has been a broader variety of local produce and better communication and cooperation between farmers and community, including education (school classes up to 10th grade), tourism sector and conservation authorities. More than 30 different partners has now joined the park- network, involving farms, hotels, adventure companies, small scale producers and shops,

community schools and associations, heritage organisations, museums etc. In an area with less than 5000 inhabitants living in, or close to the regional park, this is an indication that the regional park and the landscape is an important common arena for local development and cultural identity. The experiences from the bottom up processes in the Nærøyfjord Area has been an inspiring factor for founding a national network of local and regional landscape parks in Norway. The Department of Landscape Architecture and Spatial Planning will be starting up 3 year research project in August 2011, financed by the Norwegian Research Council, investigating current practice in local resource management and comparing different models for participation and partnership on local and regional level. Principles of adaptive management will be developed as means to enhance local participation and economic growth in the rural periphery.

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An Integrated Social and Ecological Modelling Approach to the Impacts of Agricultural Conservation Practices on Water Quality

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The progress of human societies has been highly dependent on agriculture, and the expansion and intensification of agriculture parallel the growth of human population and its footprint. However, the ecosystems upon which agriculture depends are constrained. Therefore, to move toward sustainability, we must employ policies that preserve integrity of the existing resources, while providing benefits at different scales. According to the US Farm Bill (2008), enhancing the environmental quality and the resource base is a key agricultural sustainability goal. The adoption of conservation practices is regarded as an effective strategy to enhance water quality by increasing system resilience, which improves agricultural sustainability (Veldkamp and Verburg, 2004). The central objective of the research reported here is to model the diffusion and adoption of conservation practices by farmers and its impacts on downstream water quality, with the goal of increasing agricultural sustainability, by understanding and optimizing the relationships among water quality, agro-environmental policy, and farmer adoption of conservation practices.

To abate the damage of agricultural production on ecosystem services, policies have focused on a range of solutions and institutions, including the development and application of conservation practices that are intended to alleviate negative impacts on water resources. To study the effectiveness of these solutions, the need for coupling models that incorporate dynamic feedbacks between social and biophysical systems is highlighted (Veldkamp and Verburg, 2004). This research responds to that need by examining this coupled natural and human system using a social model (Agent-based model, ABM) and a biophysically based watershed model (Soil and Water Assessment Tool, SWAT) to compare farmers' responses to agro-environmental policies, and the impacts of those responses on water quality. This integrated model also considers feedback from water quality outcomes to policy makers and farmers, through revision and implementation of different agro-environmental policies.

The study area is the Sandusky, an intensively cultivated watershed of Lake Erie, the shallowest of the Great Lakes in North America. Lake Erie had been subject to significant eutrophication from excessive phosphorus loading, primarily from non-point sources (Forster et al., 2000). Agricultural runoff resulted in algal blooms, poor water clarity, and summer hypoxia (Carpenter, 2008). Current work is developing coupled social-environmental models of the Sandusky watershed with attention to spatial patterns, socio-economic drivers of farmers' conservation practice adoption, and their water quality impacts.

An ABM is used to investigate relationships between adopter and non-adopter farmers of conservation practices as ABMs can model individual agents with distinct decision-making patterns and behaviours. Such models have previously been applied to agricultural systems (Happe et al., 2008), and can yield valuable information about responses to changes in policies that govern complex systems like those in watersheds. Existing literature about farmer adoption of conservation practices supports an investigation of how different factors such as available resources and knowledge of incentives and regulations mediate decisions about land use and applied conservation practices. In the next phase, the ABM will overlay a variety of hypothetical knowledge networks to evaluate the possible differences in spatial adoption patterns. Such an analysis can improve the understanding of social learning in adoption decisions and support farmer communication networks. The ABM is designed to study the adoption behavior of the farmers and the results will be used as

input to the SWAT model to explore the effects of the adoption patterns on water quality. For each policy alternative in the ABM, farmers respond to a different set of incentives, sanctions, and regulations, which changes their adoption decisions. Linking agent-based models with SWAT will help investigate how farmer characteristics interact with the combination of conservation practices to explain the effects of policies on water quality.

SWAT models of the Sandusky watershed are used to simulate nutrient loadings, as indicators of water quality impacts. SWAT is an integrated hydrologic and biogeochemical water quality model that is particularly well suited for exploring the impacts of land management and conservation practices and for evaluating the effectiveness of policy alternatives (Gassman et al., 2007). It is a process-based model of surface and groundwater hydrology, weather, sedimentation, soil temperature, crop growth, nutrients, and pesticides that can simulate the effects of climate and land use changes on nutrient and sediment delivery from watersheds. The SWAT-generated profiles of nutrients and eroded sediment in the surface water (Gassman et al., 2007) are used as water quality response metrics.

In this study, farmers' reactions to policies that are intended to incentivize the conservation practices and their attitudes towards adoption are critical determinants of the spatial distribution of these practices, and therefore, to the water quality outcome. By understanding and modelling the interactions among adopters and non-adopters, and simultaneously analyzing the effects of these interactions on water quality, knowledge is developed by which to evaluate the water quality results of alternative policies. This project constitutes an important step in understanding the effects of different policy approaches on the adoption of conservation practices and their impacts on downstream water quality.

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Preference Change and Multifunctional Landscape: Framework for Research and Policy

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All democratic governance is based on individual choice and decision. This is why liberal political theory has long been concerned with the nature of “preference”—at its simplest, the wish for one thing or action over another. The original theory of preference, so-called “social choice theory,” was rooted in neoclassical economics and conceived of preferences as stable, consistent, and predictable (Arrow 1951; Riker 1982). This view came under criticism in the 1970s with the recognition that human preferences can shift suddenly, and sometimes radically, in response to external and internal stimuli (Elster 1983; Frankfurt 1971). Description of preferences using the language of formal logic has now ceded to normative consideration of how preferences form and change. Preference change is one of the most widely discussed topics in political theory today, with works such as Thaler and Sunstein’s *Nudge* (2008), an argument for third-party intervention in the preferences of citizens under certain circumstances, having attracted attention from policymakers in many countries.

The question of preference change is highly relevant to contemporary landscape planning and management. It is now widely accepted that landscape plans not rooted in democratic deliberation are unlikely to be sustainable; Article 5c of the European Landscape Convention, for example, enshrines the rights of communities and individuals to determine the ways in which the landscapes close to them are managed and changed. But using individual preference to guide landscape policy poses significant problems. Preferences change from year to year and day to day, and there is often disparity between preferences for landscape “in general” and preferences with regard to specific landscapes (Khakee *et al.* 2003; Krohn *et al.* 1999). How is it possible to know that the preferences people voice with respect to landscape at one particular time and place are “real,” and should therefore take precedence over preferences that might replace them at a later moment or under different circumstances? This question is not simply academic, but represents a significant practical challenge to the realization of landscape planning goals.

Theories of preference change might be used to address this challenge in a specific area of landscape policy. There is increasing agreement that future agricultural landscapes, in order to be ecologically, economically, and socially sustainable, will need to provide a diverse array of “services” related to biodiversity, energy, and recreational amenity (Brandt *et al.* 2000; Maier *et al.* 2001). Yet such “multifunctional” landscapes can provoke negative responses among the very people who will be their managers, particularly farmers (Bjørkhaug *et al.* 2007; Walford 2003). There are frequently tensions, in other words, between the landscape preferences of individuals and the landscape goals of national, regional, and local governments. Preference change theory offers a framework for analyzing and managing such tensions.

The argument can be made in three parts. First, the theory of preference change has developed in the past decades, with emphasis on the concepts of “meta-preferences” and “preference quality.” Second, preference change has played a major, and sometimes decisive, role several recent examples of conflicts over “multifunctionality.” Third, a line of research to explore the capacity of preference change theory to improve planning for multifunctionality at the local level would help combine two closely related agendas: strengthening processes of democratic deliberation, and promoting more sustainable agricultural landscapes.

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Changing land management regimes and countryside functions. The results of a study in a Tuscan area

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Changes in land use from traditional agriculture to different uses reflect the urbanisation of the countryside, which involves many aspects, such as the increase in recreational and residential uses of rural land. One contribution to the current debates regarding the intersecting dynamics of agricultural changes and urbanisation is to ask how and why landowners differ in their attitudes towards countryside, land management and land-based/farming-based new investments, as well as what challenges their attitudes represent for the institutional policies (physical planning, agricultural policy) and for a more comprehensive policy integration.

Through the development of relational typologies, different types of landowners have been identified in two Tuscan municipalities - one of them located in the urban fringe, the other one in the rural hinterland. The data and information have been gathered through in-depth interviews with landowners, fieldtrips for direct observation, the consultation of public documents, maps and statistical data. Among the various trends emerged, we noticed that landowners and farmers tend to diversify their business by converting rural land and rural buildings into home tourism in the rural area, and into recreational or purely residential business in the fringe.

Such trends, along with the reduction of agricultural support, the liberalisation of agricultural policies, the presence of decision planning systems mainly depending on the municipal discretion, raise challenges for the government's control over land use and claim for a policy integration at local level aimed at maintaining the connection between agriculture production and land management.

Environmental constraints on agricultural landscape dynamics: A case study of Terceira Island, Azores, Portugal (2001-2011)

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The farmer and the forester are continually adjusting to nature and seeking to use her to his own advantage (Chadwick, 1971). In that regard, agricultural landscape structure and its dynamics strongly depends on farmers' land use decisions, which are limited by the natural background and driven by socioeconomic and technological developments, demographics, cultural and environmental factors, as well as government policies (OECD, 2001; Primdahl et al., 2004; Levin, 2006; Klijn, 2004; Nassauer and Wascher, 2007, Primdahl and Swaffield, 2010; Pinto-Correia and Kristensen, 2009). One approach to the assessment of environmental constraints on agricultural land use dynamics is to focus on farmer's decision-making process. Specifically probabilistic modelling of farmer's decision-making can inform detailed policy targeting within the agricultural systems of the Azores.

Terceira Island, one of the nine islands of the Azores archipelago, was chosen as a case study. Most of the surface of Terceira is devoted to agriculture, amounting in 2009 to a total area of 23 367 ha of utilized agricultural area, distributed almost entirely by pastures and forage crops (mainly maize silage). These enterprises support the activity of cattle livestock farming, as the animals stay outdoor all year round. The island economy relies heavily on milk production and the industry associated with the processing of dairy products. Even though beef production has experienced significantly positive developments in recent years (INE, 2011).

Two main agricultural landscape systems are evident: 1. intensively managed dairy landscape, with higher livestock density and productivity, and 2. semi-natural pastoral landscape, with patches of natural vegetation and/or exotic forest (Table 1).

Table 1
Selected characteristics of the two main Terceira Island agricultural landscapes

	Intensively managed dairy landscape	Semi-natural pastoral landscape
Landscape elements	Almost no hedges; farm buildings (milking parlors, barns); stonewalls	Scrubland and hedgerows; no farm buildings; forest and/or natural vegetation patches; few stonewalls
Main ongoing processes	Intensification, concentration	Expansion, extensification
Main productions	Dairy cattle	Dairy and beef
Major animals	Dairy cows	Suckler cows, dairy heifers, bulls " <i>raça brava</i> "
Major crops/pasture	Cultivated temporary grassland; maize silage	Permanent pasture (semi-natural or improved grassland)

As Terceira Island is under the influence of diversified biophysical features, the agricultural landscape dynamics should contrast from one zone to another. Specific landscape metrics (Botequilha Leitão et al., 2006) and transition matrix analyses (Pontius Jr. et al., 2004) are used to pick up the differences between the landscape structures and dynamics of the territorial units. At a

coarse level, we assume the land use classes as landscape elements, using the partially available data from the Land Parcel Identification System (LPIS) for agricultural parcels belonging to the Integrated Administration and Control System (IACS) for farmers under the Common Agricultural Policy (CAP) (MARS Unit, 2011). The biophysical delineation of territory is based on soil characteristics, temperature, precipitation and slope according to a prior categorization of environmental suitability for different activities (Silveira and Dentinho, 2010).

The results show variation of land use processes observed in Terceira Island agricultural landscape under a specific historical background and subject to different biophysical features. Taking into account the structural diversity captured, further work will focus on the role of CAP's incentive regimes as landscape drivers on the local socio-cultural framework under a global opening market and technological development processes.

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